

## ANESTHESIOLOGY, HEMATOLOGY AND SERUM CHEMISTRY OF THE GIANT OTTER, *Pteronura brasiliensis* (CARNIVORA, MUSTELIDAE)

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**ABSTRACT:** There are very few hematological values of giant otters found in the literature and despite that new anesthetic drugs became available in recent years, no information has been published regarding their use in this endangered species. Therefore, to fulfill these gaps, about 15 ml of blood were collected from the jugular or femoral veins of six captive giant otters between March-July/1995 and September-November/2004. To collect the blood, the animals were anesthetized either using 5% ketamine hydrochloride (Ketalar®-Parke-Davis) combined with xylazine (Rompun®-Bayer) in a mean dosage of  $8.78 \pm 0.91$  mg/kg and  $1.92 \pm 0.15$  mg/kg, respectively (n=4), or using tiletamine hydrochloride and zolazepam hydrochloride (Zoletil 50® - Virbac) in a mean dosage of  $1.93 \pm 0.57$  mg/kg, followed by an injection of atropine sulfate 1 % (Atropina® - Farmagráfica S.A.) in a mean dosage of  $0.09 \pm 0.02$  mg/kg (n=7). The depth and time of immobilization provided by both associations allowed the accomplishment of all the veterinary procedures with satisfactory safety. The mean rectal temperature recorded during immobilization was  $39.16 \pm 0.59^{\circ}\text{C}$  (n=8). The hemoglobin and packed cell volume (PCV) mean values were  $16.36 \pm 2.81$  g/dl and  $50.66 \pm 7.77$  %, respectively. The WBC, lymphocytes, monocytes, and eosinophils values were similar to those reported for other otter species. Similarly, the blood chemistry values were close to those found in other mustelids. Considering that all animals used in this study were clinically healthy, the hematologic and blood chemistry values here presented provide a baseline for recognition of abnormal blood values in giant otters.

**KEYWORDS:** Anesthesia. Blood parameters. Giant otter. *Pteronura brasiliensis*. Threatened species.

### ANESTESIOLOGIA, HEMATOLOGIA E BIOQUÍMICA SANGÜÍNEA DE ARIRANHA, *Pteronura brasiliensis* (CARNIVORA, MUSTELIDAE)

**RESUMO:** Existem poucos dados hematológicos de ariranhas na literatura, e embora novas drogas anestésicas se tenham tornado disponíveis nos últimos anos, inexistente informação publicada acerca de seus usos nesta espécie. Com o intuito de preencher estas lacunas, cerca de 15ml de sangue foram colhidos da veia jugular ou femoral de seis ariranhas cativas entre março-julho/1995 e setembro-novembro/ 2004. Para colher o sangue, as ariranhas foram anestesiadas utilizando um dos seguintes protocolos: 5% cloridrato de cetamina (Ketalar®-Parke-Davis) em associação com xilazina (Rompun®-Bayer) em dosagens médias de  $8,78 \pm 0,91$  mg/kg e  $1,92 \pm 0,15$  mg/kg, respectivamente (n=4), ou usando cloridrato de tiletamina e cloridrato de zolazepam (Zoletil 50® - Virbac) em dosagem média de  $1,93 \pm 0,57$  mg/kg, seguida por uma injeção de sulfato de atropina 1 % (Atropina® - Farmagráfica S.A.) em dosagem média de  $0,09 \pm 0,02$  mg/kg (n=7). A profundidade e o tempo de anestesia proporcionados pelas duas associações de drogas permitiram que todos os procedimentos veterinários fossem realizados com segurança. A temperatura retal registrada durante a imobilização teve uma média de  $39,16 \pm 0,59^{\circ}\text{C}$  (n=8). As médias de hemoglobina e hematócrito foram  $16,36 \pm 2,81$  g/dl e  $50,66 \pm 7,77$  %, respectivamente. Os valores de leucócitos, linfócitos, monócitos e eosinófilos foram similares aos observados para outras espécies de lontras. Da mesma forma, os valores da bioquímica sérica foram semelhantes aos encontrados para outros mustelídeos. Considerando que os animais utilizados neste estudo estavam clinicamente saudáveis, os valores hematológicos e bioquímicos apresentados podem servir de base para reconhecer valores anormais em ariranhas.

**PALAVRAS-CHAVE:** Anestesia. Parâmetros sanguíneos. Ariranha. *Pteronura brasiliensis*. Espécie ameaçada.

### ANESTESIOLOGÍA, HEMATOLOGÍA Y BIOQUÍMICA SANGÜÍNEA DE ARIRANHA, *Pteronura brasiliensis* (CARNÍVORA, MUSTELIDAE)

**RESUMEN:** Existen pocos datos hematológicos de ariranhas (*Pteronura brasiliensis*) en la literatura, aunque nuevas drogas anestésicas se hicieron disponibles en los últimos años, inexistente información publicada acerca de sus usos en esta especie. Con la intención de rellenar estos vacíos, alrededor de 15ml de sangre fueron colectados de la vena yugular o femoral de

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seis ariranhas cautivas entre marzo-julio/1995 y septiembre-noviembre/2004. Para colectar la sangre, las ariranhas fueron anestesiadas utilizando uno de los siguientes protocolos: 5% clorhidrato de cetamina (Ketalar® -Parke-Davis) en asociación con xilazina (Rompun®-Bayer) en dosis medianas de  $8,78 \pm 0,91$  mg/kg y  $1,92 \pm 0,15$  mg/kg, respectivamente (n=4), o usando clorhidrato de tiletamina y clorhidrato de zolazepam (Zoletil® 50 – Virbac) en dosis mediana de  $1,93 \pm 0,57$  mg/kg, seguida por una inyección de sulfato de atropina 1% (Atropina® -Farmagráfica S.A.) en dosis mediana de  $0,09 \pm 0,02$  mg/kg (n=7). La profundidad y el tiempo de anestesia proporcionados por las dos asociaciones de drogas permitieron que todos los procedimientos veterinarios fuesen realizados con seguridad. La temperatura rectal registrada durante la inmovilización tuvo una media de  $39,16 \pm 2,81$  g/dl y  $50,66 \pm 7,77\%$ , respectivamente. Los valores de leucocitos, linfocitos, monocitos y eosinófilos fueron similares a los observados para otras especies de nutrias. De la misma forma, los valores de bioquímica sérica fueron semejantes a los encontrados para otros mustelídeos. Considerando que los animales utilizados en este estudio estaban clínicamente saludables, los valores hematológicos y bioquímicos presentados pueden servir de base para reconocer valores anormales en ariranhas.

**PALABRAS CLAVE:** Anestesia. Parámetros sanguíneos. Ariranha. *Pteronura brasiliensis*. Especie amenazada.

## Introduction

The giant otter, *Pteronura brasiliensis*, is an endemic species of South America, with a large historical distribution, occurring from the north of the continent to the northern part of Argentina. Due to intense hunting and habitat destruction, some populations have been depleted and are considered locally extinct in some places (ROSAS et al., 1991; CARTER; ROSAS, 1997). Nowadays, *P. brasiliensis* is listed as an endangered species by the IUCN (2006).

Anesthetic doses, induction, unconsciousness, and recovering time in *P. brasiliensis* and *Lontra longicaudis* have been presented by Marsicano et al. (1986). Blood parameters of giant otters were studied by Colares and Best (1991), who determined red blood cell content, hemoglobin, packed cell volume, mean corpuscular hemoglobin, white blood cells, and leukocyte differential in a single captive individual.

In this study we present and discuss anesthesia protocols using different combination of drugs and some physiological parameters during immobilization. We also provide hematological data and blood biochemistry of several captive giant otters.

## Materials and Methods

Blood samples were obtained from six giant otters (three males and three females) maintained in captivity at the National Institute of Amazonian Research (INPA), Manaus, Amazonas, Brazil. The total length of the giant otters studied varied from 150 to 160 cm, and the total body weight varied from 18.6 kg to 28.8 kg. All the animals analysed in this study were judged to be clinically healthy, based on their general appearance, and were anesthetized to treat minor wounds, except for one adult female, which was anesthetized in 1995 for a gingivitis treatment. In this case, hematological and serum chemistry values were not included in the analysis.

The animals were immobilized using two different protocols: 1) Four giant otters were anesthetized in 1995 using 5% ketamine hydrochloride (Ketalar®-Parke-Davis<sup>4</sup>) combined with xylazine (Rompun®-Bayer<sup>5</sup>), according to

Colares and Best (1991), and 2) Seven animals (some of them were the same ones immobilized in 1995) were anesthetized in 2004 using tiletamine hydrochloride and zolazepam hydrochloride (Zoletil 50® - Virbac<sup>6</sup>), along with 1% atropine sulfate (Atropina® - Farmagráfica S.A.<sup>7</sup>). For safety reasons, all the used dosages were lower than those recommended by the manufacturers and were given intramuscularly. Dosages are presented in the results section. During immobilization, physiological data such as the rectal temperature were also monitored. About 15 ml of blood were collected from either the jugular or the femoral veins and used for hematology and serum biochemical analyses.

## Results

When using ketamine in association with xylazine the dosages (mean  $\pm$  standard deviation) were  $8.78 \pm 0.91$  mg/kg and  $1.92 \pm 0.15$  mg/kg, respectively. When using Zoletil, the mean dosage applied was  $1.93 \pm 0.57$  mg/kg, followed by an injection of atropine in a mean dosage of  $0.09 \pm 0.02$  mg/kg. The induction time when ketamine was used in association with xylazine was  $7.75 \pm 0.96$  min, in contrast to  $4.33 \pm 0.58$  min when using Zoletil (Table 1). The rectal temperature (mean  $\pm$  standard deviation) was  $39.16 \pm 0.59^\circ\text{C}$ .

The mean packed cell volume and hemoglobin values obtained were  $50.66 \pm 7.77\%$  and  $16.36 \pm 2.81$  g/dL, respectively. Mean red blood cell (RBC) counts for females and males were  $6.82 \pm 1.64$   $10^6/\text{mm}^3$  and  $5.860 \pm 0.59$   $10^6/\text{mm}^3$ , respectively, and the mean white blood cell (WBC) counts were  $6.325 \pm 1.52$   $10^3/\text{mm}^3$  for females and  $4.77 \pm 1.66$   $10^3/\text{mm}^3$  for males. The results of the hematological studies are presented in Table 2. Blood chemistry results are presented in Table 3.

<sup>4</sup>Ketalar®, Parke-Davis, Manaus – AM.

<sup>5</sup>Rompun®, Bayer do Brasil S.A., Manaus – AM

<sup>6</sup>Zoletil 50®, Virbac, Manaus – AM.

<sup>7</sup>Atropina®, Farmagráfica S.A., Manaus - A.M.

**Table 1.** Anesthetic dosages and induction time during immobilization of giant otters (*Pteronura brasiliensis*).

	Dosage (mg/kg) (IM)	Induction Time (min)
	Mean $\pm$ s.d.	n
ketamine 5% + xylazine 2%	8.78 $\pm$ 0.91 1.92 $\pm$ 0.15	4
tiletamine/ zolazepan with atropine 1%	1.93 $\pm$ 0.57 0.09 $\pm$ 0.02	7

**Table 2.** Hematological values of giant otters (*Pteronura brasiliensis*).

Erythrogram	n	Range	Mean $\pm$ s.d.
RBC - $10^6/\text{mm}^3$	6	5.27 - 8.61	6.42 $\pm$ 1.21
Hemoglobin - G% - g/dL	6	13.93 - 21.20	16.36 $\pm$ 2.81
PCV - %	6	41.3 - 62.60	50.66 $\pm$ 7.77
MCV - fL	4	65.00 - 82.50	74.63 $\pm$ 7.50
MCH - pg	4	21.83 - 26.20	24.58 $\pm$ 1.94
MCHC - g/dL	4	32.05 - 33.90	33.05 $\pm$ 0.83
RDW - %	4	12.50 - 18.65	14.54 $\pm$ 2.88
Platelets - $10^3/\text{mm}^3$	4	198.00 - 619.50	401.81 $\pm$ 178.41
PDW - %	2	11.75 - 16.80	14.28 $\pm$ 3.57
Leukogram	n	Range	Mean $\pm$ s.d.
WBC - $10^3/\text{mm}^3$	6	2.80 - 7.40	5.40 $\pm$ 1.94
Basophils - %	6	0.00 - 0.70	0.30 $\pm$ 0.31
Eosinophils - %	6	0.00 - 2.30	0.87 $\pm$ 0.85
Segmented neutrophils - %	6	74.00 - 83.00	80.03 $\pm$ 3.25
Lymphocytes - %	6	13.68 - 22.00	16.24 $\pm$ 2.93
Monocytes - %	4	0.80 - 1.55	1.10 $\pm$ 0.32

RBC=red blood cells; PCV=packed cell volume; MCV=mean corpuscular volume; MCH=mean corpuscular hemoglobin; MCHC= mean corpuscular hemoglobin concentration; RDW=red cell distribution width; PDW=platelet distribution width; WBC=white blood cells.

**Table 3.** Biochemistry values of giant otters.

	n	Range	Mean $\pm$ s.d.
Glucose - mg/dL	3	59.00 - 143.00	100.67 $\pm$ 42.00
Uric Acid - mg/dL	3	0.80 - 1.70	1.33 $\pm$ 0.47
Urea - mg/dL	2	99.00 - 344.00	221.50 $\pm$ 173.24
Creatinine- mg/dL	3	1.10 - 2.80	1.80 $\pm$ 0.89
Cholesterol - mg/dL	3	208.00 - 439.00	314.33 $\pm$ 116.59
Triglycerides - mg/dL	3	17.00 - 22.00	19.50 $\pm$ 3.54
Aspartate aminotransferase (AST-Trans) -U/L	3	142.00 - 223.00	183.67 $\pm$ 40.55
Alanine minotransferase (ALT- Trans) -U/L	3	58.00 - 209.00	114.33 $\pm$ 82.48
Total Bilirubin - mg/ dL	3	0.20 - 0.20	0.20 $\pm$ 0.00
Alkaline Phosphates - U/L	3	40.00 - 77.00	53.33 $\pm$ 20.55
Lactic dehydrogenase (LDH) - mg/dL	3	969.00 - 1480.00	1226.33 $\pm$ 255.52
Gama GT - U/L	3	17.00 - 19.00	17.67 $\pm$ 1.15
Amylase - U/L	3	4.00 - 12.00	9.33 $\pm$ 4.62
Calcium - mg/dL	3	8.80 - 10.00	9.57 $\pm$ 0.67
Phosphorus - mg/dL	3	4.40 - 8.20	5.80 $\pm$ 2.09
Magnesium - mg/dL	3	1.60 - 7.70	3.73 $\pm$ 3.44
Total Protein - g/dL	2	6.90 - 7.10	7.00 $\pm$ 0.14
Albumin - g/dL	3	3.40 - 3.90	3.60 $\pm$ 0.26
Globulin - g/dL	1	3.70	3.70

## Discussion

Data on anesthesia of giant otters have been presented by Marsicano et al. (1986), who used ketamine hydrochloride without association with xylazine to anesthetize neotropical otters (*Lontra longicaudis*) and giant otters (*P. brasiliensis*). However, the authors reported that one of the immobilized giant otters presented severe convulsion during its recovery. This could perhaps be avoided using xylazine, which has among its properties, the ability to avoid convulsions. Therefore, in 1995 when anesthetizing giant otters it was used ketamine in association with xylazine, as recommended by Colares and Best (1991), and none of the animals anesthetized with these drugs presented convulsion or any other problem caused by anesthesia.

When comparing our data using ketamine combined with xylazine with the results presented by Marsicano et

al. (1986) using only ketamine (mean dosage of  $10.28 \pm 0.40$  mg/kg), the mean induction time observed in the present study was 54% greater. Additionally, the time of unconsciousness mentioned by Marsicano et al. (1986) was 19% greater than that reported here. The latter difference is probably due to the larger dosage used by Marsicano et al. (1986), who applied an average of 10.28 mg/kg (SD=0.40, n=2) of ketamine in contrast to a mean of 8.24 mg/kg (SD=0.72, n=4) used in the present study. On the other hand, Pimentel et al. (2001) suggested much greater doses of ketamine (20-40 mg/kg) when immobilizing mustelids. Nevertheless, the dosages used here were approximately  $\frac{1}{3}$  of that, reaching surgical level and providing a mean time of 61 minutes of unconsciousness with great safety.

Despite the dosage differences between Marsicano et al. (1986) and the ones used in this study, the animals' rectal temperature were very similar in both cases. This could suggest that this physiological parameter is representative of the "normal range" for the species under chemical restraint and could be used as a basis for further anesthesia procedures.

Nowadays, most anesthetic procedures recommend using tiletamine hydrochloride and zolazepam hydrochloride (Zoletil®), which is considered safer because it provides better stability during the induction period. Induction time when using Zoletil® was 56% smaller than when using ketamine in association with xylazine. According to Holz (2002), Zoletil® also has the advantage of using a low volume and presenting a rapid effect. Relaxation, however, can be variable - in Tasmanian devils a continuous paddling movement has been observed when anesthetized with Zoletil® (Holz, 1992). In the present study, due to the low doses of Zoletil®, the giant otters did not reach surgical level; however, the dosages used were adequate for routine medical procedures and treating superficial wounds since animals reached muscular relaxation and unconsciousness.

Concerning the erythrogram, only the RBC and mean corpuscular volume (MCV) were similar to those presented by Colares and Best (1991). The erythrogram parameters obtained in this study were very similar to the data of a single giant otter presented by Colares and Best (1991). However, the leukogram data presented by those authors, especially eosinophils, lymphocytes, and monocytes, were all greater than the values observed in this study. These data suggest that the giant otter analyzed by Colares and Best (1991) could have had an infectious disease at the time when their study was carried out. Nevertheless, considering the small number of giant otters analyzed by Colares and Best (1991) (n=1), these differences could simply reflect a normal variation in hematological values of the species. According to Macneill (1975), small variations in hematology can be due to individual differences, and hematological parameters used by a veterinary practitioner should be established on an individual basis. However, giant otters can be expected to respond hematologically to diseases in the same way as most domestic animals, and the hematological data presented here may be used to evaluate the health of captive and free-ranging individuals.

Concerning the serum chemistry values of giant otters, only glucose, creatinine, cholesterol, bilirubin, albumin, and globulin could be compared with data presented by

Colares and Best (1991). Except for glucose, all the above-mentioned biochemical values were very similar in both studies. The high glucose value presented by Colares and Best (1991) is probably due to the pre-anesthetic stress suffered by the giant otter analyzed by them. On the other hand, the mean glucose value observed in the present study was very similar to the mean glucose values of American river otters (*Lontra canadensis*) and sea otters (*Enhydra lutris*) (WILLIAMS and PULLEY, 1983; HOOVER et al., 1985). Therefore, the serum chemistry values here presented are probably also representative of the normal values for giant otters and could be used as a reference for clinical procedures when necessary.

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